

# Factors related to Twitter user's decision making of information spreading during disasters

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**Abstract** The use of Twitter as disaster communication tools rose rapidly in Japan after The Great East Japan Earthquake on March 11, 2011. However, the extensive use of Twitter raised an important issue to be addressed, where Twitter also facilitated the spread of misinformation during disasters. Accordingly, we conducted a web survey (n=1,032) to identify factors related to Twitter user's decision making to spread disaster information during disasters. We present the results of the exploratory factor analyses and discuss our findings in this paper.

## 1 Introduction

The Great East Japan Earthquake with 9.0 magnitudes on March 11, 2011 was the most catastrophic disaster ever hit Japan in the new century. During the disaster, cellular communication and landline service are disrupted due to the surge of network activity while Internet service via 3G network is available. This is how the social media extending its role beyond connecting people and as information hub, but also as a dependable disaster communication tool. Just after the earthquake strike, Twitter was flooded with various information reporting self-experience, warning, fact, safety status and even rumor and hoax messages [1,2,3].

In ambiguity and uncertain situation during disaster, with lots of information received from social media, information overload raised an issue to be addressed. Information credibility [4,5,6] and the

spread of misinformation and rumor transmission [7,8,9] raised an issue with social media used during emergencies. As Twitter provides real-time information generation, information can continuously changing from correct to incorrect due to retweeting timing [10].

Thus, the motivation of this study is by the need to understand the user behavior of disaster information diffusion which may cause the spread of misinformation in already tense situation during disasters. Our research aim is towards developing human information sharing decision-making model in disaster situation. This could gain insight of the situation when people are bombarded with information overload, some people may unintentionally pass along misinformation or rumor which in turns cause it to be widely spread during emergencies.

Our ongoing research work is to investigate factors related to one decision

making to spread disaster information using retweet function in disaster situation. The brainstorming sessions (n=10) were conducted to answer the question of: Why people spread (by using retweet) disaster-related information they read in Twitter in disaster situation?

Next, we use KJ method to sort and categorized the collective ideas generated from brainstorming session. Then, we build the questionnaire construct by integrating with previous question items [11]. We conducted preliminary study (n=57) to test the questionnaire developed and finally, we conducted web survey with 1032 respondents all over Japan. This paper presents the result of the exploratory factor analysis on the web survey. In our study, we focus on the scenario when a Twitter user reads disaster-related information in a disaster situation, and investigate the factors that influence the user's decision to spread by retweet this information.

The rest of the paper is organized as follows. Section 2 presents the background of the study. In section 3, we describe about the survey. Meanwhile, section 4 describes the factor analysis and findings. Next, section 5 is the discussion and finally, we conclude our paper in section 6.

## 2 Background of the study

We reviewed related work on misinformation or rumor spreading behavior from rumor psychology area and human decision-making during emergencies from emergency management area align with our research focus. From rumor psychology background, Allport and

Postman stated two basic conditions for rumor, which are the story theme is important to speaker and listener, and surrounded in some kind of ambiguity [12]. From sociology view, according to Shibutani, rumor is a collective transaction of cognitive and communicative activity [13]. DiFonzo and Bordia listed five variables on rumor transmission which are uncertainty, importance, lack of control, anxiety and belief [14].

There are few research from psychological viewpoint examines the relationship between importance, anxiety, distance and feelings with rumor transmission and information sharing behavior using Twitter during disasters [9,15,16,17]. However, these studies lack of the nature of Twitter features such as number of retweet as collective opinion, followers influence and the absence of cognitive and trust factors.

Meanwhile, judgment and decision-making for emergency managers under stress influence by analytical or cognitive factors such as knowledge one possess, experience and emotion [18]. There is also an assumption that time pressure impact level of stress [19] and information processing increase as time pressure increase [20]. Dugdale et al. [21] stated that the emotional state of the citizens affects texting behavior during 2010 Haiti Earthquake.

In recent years, research in emergency management area focus on the utilization of social media for mass collaboration in response and rescue for emergency professional [4,5,7]. With citizen participation on supplying disaster information through their own social network, trustworthiness, information

overload and privacy issues are among raised barrier for emergency managers to utilized social media [22]. Citizen participation, the community involvement and social computing can leads to successful emergency preparedness and management [23].

Thus, this research aims to gain insights of what makes the social media users to spread disaster information during disasters. Compared to Facebook and other social media services, Twitter is the top medium to gather disaster information after 2011 The Great East Japan Earthquake in Japan [24,25].

### 3 The Survey

#### 3.1 The preliminary survey

The survey was held on 2<sup>nd</sup> of February 2015 with 57 respondents of Iwate Prefectural University students. The purpose of the preliminary survey is to test the questionnaire before we distribute it in the web survey. For the analysis part, we performed exploratory factor analysis (EFA) with maximum likelihood method to analyze the problem question items statistically. Then, we performed Cronbach alpha as the reliability test to measure the internal consistency of the answers. Initial question items in the questionnaire are 45 items. However, we excluded 7 items with floor effect, low communalities, and problem with Cronbach alpha value during the reliability test in EFA. Thus, 38 question items remained for the web survey.

#### 3.2 The web survey

The web survey was conducted from 27 to 31<sup>st</sup> of July 2015 with total number of 1032 respondents from all over Japan. There are 478 male and 554 female participated in the survey. All respondents are the Twitter user and they use Twitter daily including in disaster situation. We also collect the respondents' demographic information such as gender, age, prefecture, job, their role during 3/11 disaster and their Twitter usage. The next part of the questionnaire is the 7-Likert scale questions on retweeting behavior on disaster information during disasters. We analyze 38 question items in the questionnaire. Out of 38 question items analyzed, there is a 1 question (question 5) with a floor effect problem. Thus, we exclude this item from the analysis and we perform EFA with 37 question items.

### 4 Factor Analysis and Findings

The result of the factor analysis found that 4 factors derived. The 4 factors were explained by 61.935% (Cumulative) as a total. The cumulative value describes how much the factors explain all the question items. For the reliability measure, the Cronbach's coefficient alpha for each factor subscale factor 1, factor 2, factor 3, and factor 4 are 0.931, 0.960, 0.850, and 0.893 respectively. For the reliability test, the value we got is an acceptable value. Table 1 shows the factor loadings for each factor.

We identified the factors as factors related to Twitter user's decision making of information spreading during disasters as

follows:

**Factor 1: Want people to know because the information is believable.**

This factor consists of 11 items related to individual evaluation as the information is believable and should be spread. For example, the information come from credible source, the information that retweeter has knowledge of it and they believe it is important for other people to know.

**Factor 2: Willingness to collect relevant information to help someone.**

This factor consists of 15 items regarding the individual act to collect related information which is relevant for oneself and their followers. It includes the information from people they trust, and updated information which is helpful as early information for safety status check.

**Factor 3: 'Retweeter' expectation and interest.**

This factor consists of 6 items related to retweeter`s expectation to perform retweet because the information capture their interest and they feel excited to share about the unusual situation topic occur during disaster.

**Factor 4: Want to get feedback and alert other people.**

This factor consists of 5 items regarding individual act to perform retweet because they want to get respond and feedback from the audience, and also to remind other people so that they are alert about it.

**Table 1.** Factor pattern matrix

No.	F1 (α= 0.931)	F2(α= 0.960)	F3(α= 0.850)	F4(α = 0.893.)
13	.816	.195	-.159	-.149
10	.800	.007	-.114	-.009
7	.702	-.084	.270	-.068

11	.699	.067	.048	.082
9	.652	-.027	.128	.139
14	.541	.130	-.146	.226
27	.528	.516	-.230	-.016
2	.511	-.126	.302	.124
19	.473	.236	.039	.105
12	.458	.224	.018	.161
16	.377	.161	.275	.072
22	.207	.680	-.037	-.035
23	.148	.667	.026	-.041
34	.021	.662	.100	.078
32	.069	.641	-.062	.172
24	.273	.640	-.077	-.007
33	-.054	.625	.050	.276
28	.360	.615	-.031	-.043
21	-.026	.611	.184	.023
35	.320	.586	.038	-.062
26	.292	.580	-.007	.043
25	.342	.572	-.013	-.009
36	-.060	.570	.402	-.063
29	.264	.556	.025	.030
38	.166	.496	.210	-.067
30	-.105	.495	.383	.107
4	-.022	-.060	.786	.107
1	.282	-.012	.612	-.061
6	-.093	-.035	.592	.276
37	-.283	.387	.537	.032
3	.428	.101	.446	-.242
20	.060	.277	.390	.183
18	-.044	.021	.042	.878
17	.005	.139	.096	.673
31	-.172	.370	.043	.641
8	.265	-.226	.218	.555
15	.276	.076	.021	.489
Cumulative %	51.632	57.283	59.997	61.935
Factor correlation matrix: F1	1.000	-	-	-
F2	.719	1.000	-	-
F3	.533	.615	1.000	-
F4	.515	.671	.669	1.000

## 5 Discussion

The findings presented in this paper are regarding factors that may influence Twitter user decision to retweet disaster information in the context of Twitter as disaster communication tool. As we can see from the extracted factors, people retweet to spread the information which they evaluate as believable, the information are relevant for oneself and their followers, interesting information which captured their own interest and with the purpose to get feedback from the audience and alert other people.

This reason is consistent with Lee [26] on the trustworthiness of the tweet content as the reason of why people retweet. Gantt [27] indicate that people tend to have pro-social behavior in crisis situation. Retweet is also an action to help other people by providing information which might be useful to other affected people. However, since the information might be accurate or false, by retweeting, people can get instant feedback from the followers regarding the information they spread.

Despite the purpose to help other person, it is interesting that we also discovered the third factor, which is the individual desire to retweet because of their self-interest on the information, and they feel excited to share about the unusual topic. It includes the joke or fun type of disaster information. The act of spreading trending topics [7] is also the reasons of why people retweet during disasters.

## 6 Conclusion

With the advance of social media,

information seeking, exchange and information spreading can reach greater number of audience in short time with a single click, retweet. The main findings can be summarized as follows: 1) individual spread the information for other people satisfaction, and 2) individual spread the information to fulfill their own satisfaction and need. However, future work is needed to validate the findings and we aim to build the human information sharing decision-making model in disaster situation. By understanding why people decide to spread disaster information, we could gain insight on human behavior of information spreading to better prepare for future disasters.

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